

SYLLABUS

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4.1 INTRODUCTION

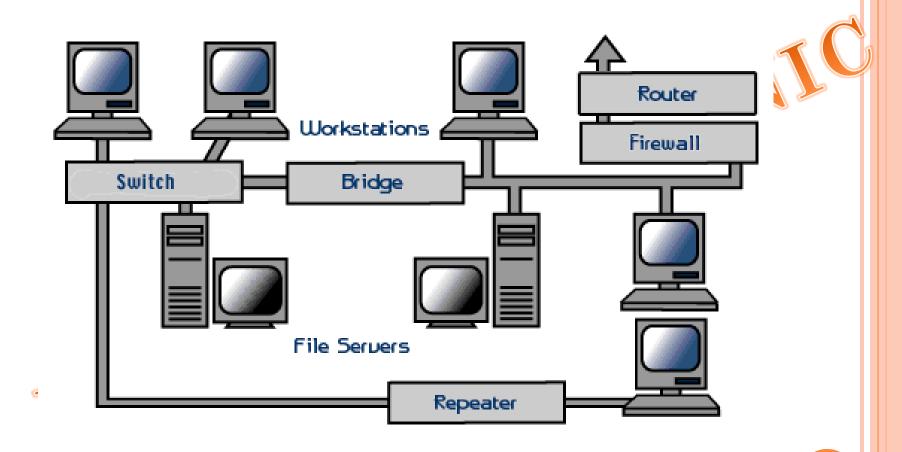
- **Network:** Two or more **devices** connected with each other for sharing their data and resources is called a network.
- Internetworking: When two or more networks are connected for exchanging data or resources then it is called internetworking.
- Devices used in networking and intranetworking:
 - Repeater
 - Bridge
 - Hub
 - Switch
 - Router
 - Gateway
 - Access point

4.2 Network Devices

•Devices and the layers at which they operate

Layer	Name of Layer	Device
7	Application	Gateway
6	Presentation	Gateway
5	Session	Gateway
4	Transport	Gateway
3	Network	Routers, layer-3 Switches, Gateway
2	Data Link	Layer-2 Switches, Bridges, NIC's, Gateway
1	Physical	Hubs, Repeaters, Bridges, Gateway

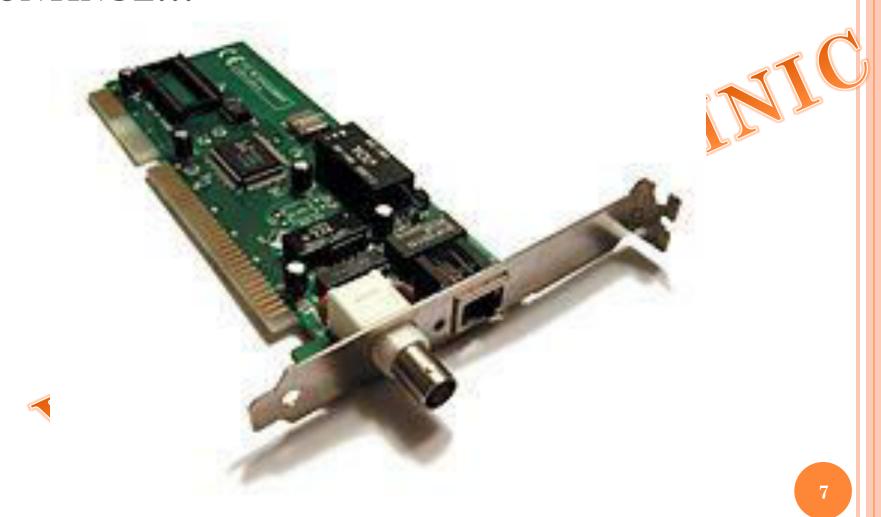
4.2 Network Devices



4.2.1 NIC (NETWORK INTERFACES CARD)

- NIC is a small printed circuit board that is installed on a motherboard of CPU.
- It provides interface between computer's internal system resources and external network resources.
- NIC has unique physical address(MAC address).
- This NIC has interfaces for twisted pair, thicknet, and thinnet connectors.
- Two types:
 - 1. ARCNET card
 - 2 ETHERNET card

4.2.1 NIC (NETWORK INTERFACES CARD) CONTINUE...



4.2.1 NIC (NETWORK INTERFACES CARD) CONTINUE...

ARCNET

- It consist eight dual inline package(DIP) switches.
- It supports MCA(micro channel architecture) bus.
- It is used with coaxial cable and RG-62 connector.
- It has BNC connector and jumpers on a card.
- It is generally implemented in star topology.
- It consist of boot ROM.
- o It has 8 and 16 bit port.
- Its data transmission rate is 2.5 mbps.

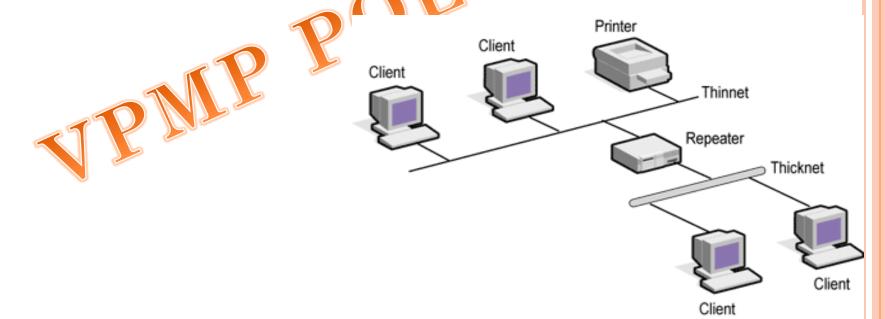
4.2.1 NIC (NETWORK INTERFACES CARD) CONTINUE...

ETHERNET

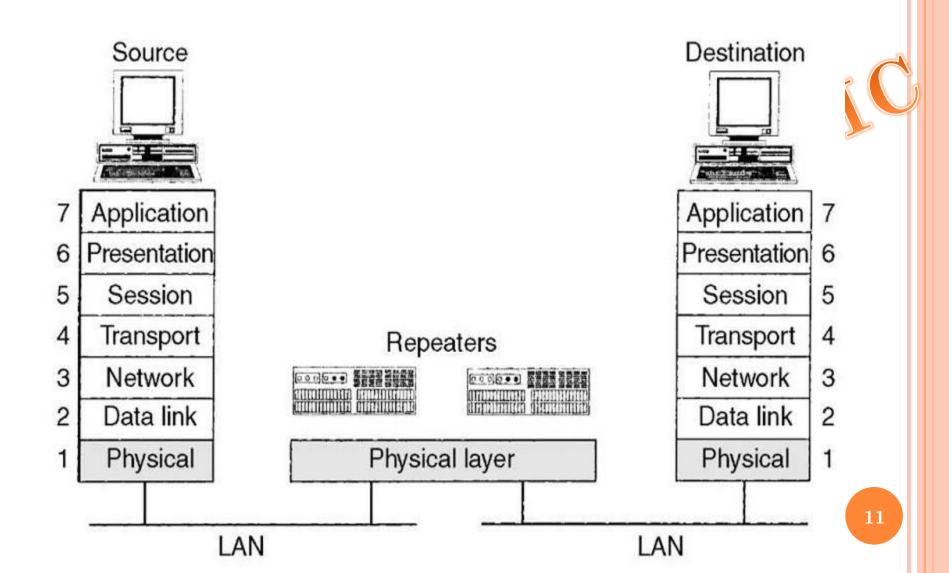
- o DIP switches are not available.
- It consist of PCI(peripheral component interconnect) bus.
- It is generally implemented in bus topology.
- It is available in 8,16, and 32 slots.
- o Thick Ethernet card uses AUI connector with 25-pin.
- o Thin Ethernet card uses BNC connector.
- It is used with coaxial cable and RG-58 connector.
- Thin and thick Ethernet are available.
- Its data transmission rate is 10 mbps.

4.2.2 REPEATERS

- It works on physical layer of OSI model.
- Repeaters clean, amplify, and resend signals that are weakened by long cable length.
- Repeaters installed in a network, receives weak signals and regenerates it to original strength to forward refreshed copy on a link.
- o They can Built-in to hubs or switches.



4.2.2 REPEATERS CONTINUE...



4.2.2 Repeaters continue...

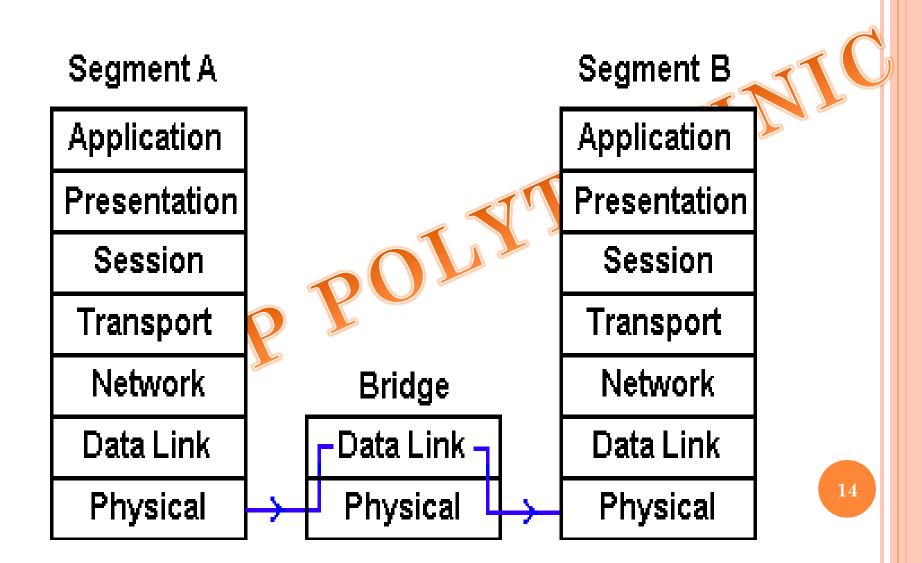
- "Repeaters does not amplify"-Justify.
- An amplifier can not differentiate between original signal and noise signal.
- Repeaters does not amplify the signal, it regenerate it. When it receives a signal affected by noise signal, it creates a copy bit to its original strength.



4.2.3 BRIDGES

- Bridges work at Datalink Layer of OSI model.
- It is designed to connect two or more LAN segments.
- At layer 1, it is used to regenerate a signal.
- At layer 2, it is used to filter traffic on a LAN and to keep local traffic local and also allow connectivity to other segments of the network.
- To provide **security**, it Filters traffic by looking at the MAC address and prevent unauthorized access.
- If the frame is addressed to a MAC address on the local side of the bridge, it is not forwarded to the other segment. Frames having MAC addresses on the other segment only are forwarded.
- Bridges maintain a MAC address table for both segments to which they are connected.

4.2.3 BRIDGES CONTINUE...



4.2.3 BRIDGES CONTINUE...



- •Difference between repeater and bridge:
- •Repeaters retransmit frames to all the connected devices in a network, while
- •Bridges transmit frames only to the segment in which device with MAC address specified in frame is present.

4.2.3 BRIDGES CONTINUE...

- Types of bridges:
- Simple bridge:
 - It links two segments only.
 - It is having lowest cost among other types.
 - It require manual updating of bridging table.
 - Requires more time to maintain devices.

2. Multiport bridges:

- It links more then two segments.
- Three table are created, each stores physical address of stations reachable through corresponding port.

3. Transparent Bridges:

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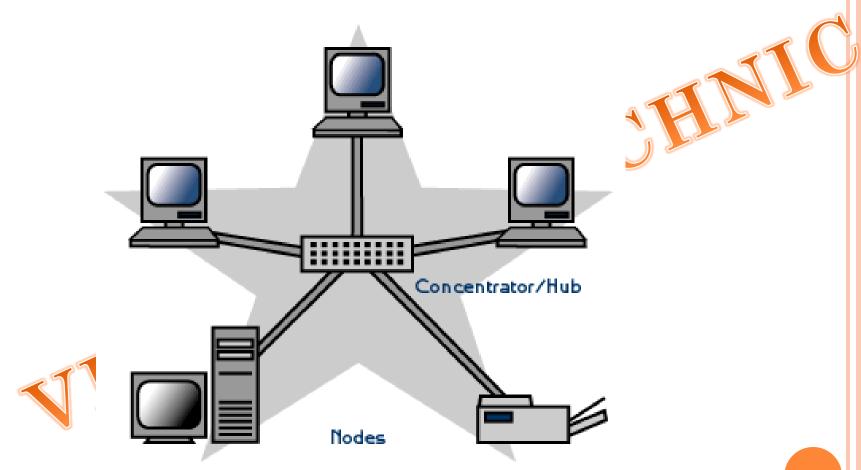
- It builds its tables of physical station address on its own.
- It performs bridge functions by its own.
- Table is automatically built by frame movement in a

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4.2.4 HUB

- It works on physical layer of OSI model.
- Hubs is a central network device that connects network nodes and provide central network management..
- They connects devices centrally in a star topology.
- They cannot filter network traffic.
- They cannot determine best path.
- They are also known as network "concentrators".
- They have multiple inputs and outputs active at the same time.
- It provides connections for all guided media types.
- They provide high speed communication.

4.2.4 HUB CONTINUE...



4.2.4 HUB CONTINUE

• TYPES OF HUB:

1. Active hubs:

- Active hubs work similar to repeaters.
- They need electrical power to run.
- Also called multiport repeater.

2. Passive hubs:

- A passive hub serves simply provides connection between devices, enabling data to go from one device (or segment) to another.
- They don't need electrical power to run.

3. Intelligent hubs:

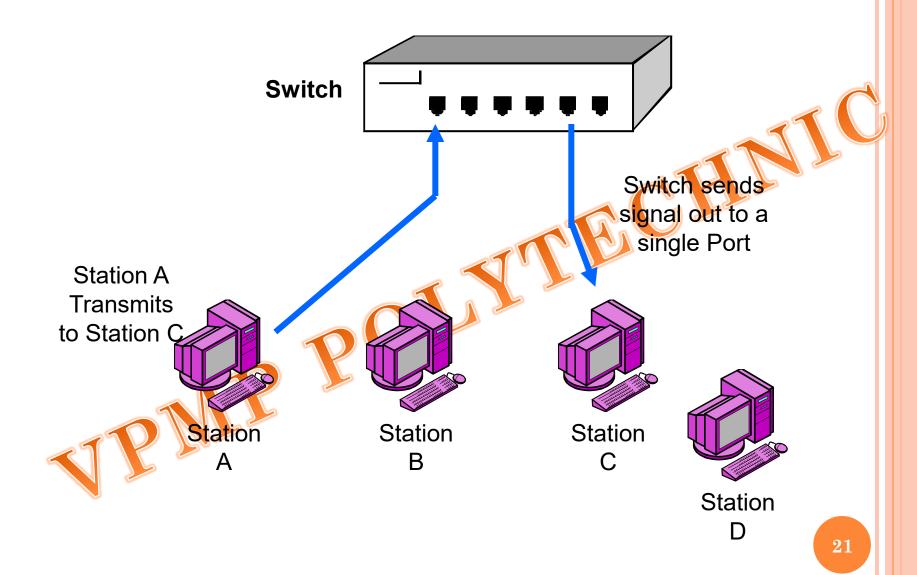
- A third type of hub, called a *intelligent hub*, actually reads the destination address of each packet and then forwards the packet to the correct port.
- Intelligent hubs are also called *manageable hubs*.

4.2.5 SWITCHES

- It works on Datalink layer of OSI model.
- It provides bridging with greater efficiency.
- They have buffer for each link to which it is connected.



4.2.5 SWITCHES CONTINUE



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- Types of switches:
- **Store and Forward Switches:**
- Do error checking on each frame after the entire frame has arrived into the switch.
- It stores the frame into buffer until whole packet arrives.
- The switch looks in its MAC address table for the port to which to forward the destination device.
- Highly reliable because doesn't forward bad frames.
- Slower than other types of switches because it holds on to each frame until it is completely received to check for errors before forwarding

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4.2.5 SWITCHES CONTINUE...

2. Cut Through Switches:

- Faster than store and forward because doesn't perform error checking on frames.
- It Forwards bad frames too.
- Reads address information for each frame as the frames enter the switch.
- After looking up the port of the destination device, frame is forwarded without waiting for entire packet to arrive.

4.2.5 Layer 2 & 3 Switches differences

Layer 2 switch	Layer 3 switch
Works on Datalink layer.	Works on network layer.
It uses MAC address for filtering and provide bridging	It uses MAC address to provide packet forwarding.
It behaves as a multiport transparent bridge.	It behaves as a router.
It is used to connect server and clients.	
<u>e</u>	it is having faster table lookup and forwarding capacity.

4.2.6 ROUTERS

- It operates on Physical, Datalink and Network layer of OSI model.
- It is most active in Network layer of OSI model.
- o Different networks can be connected via routers.
- It stores **IP address** of the devices of networks in a table called routing table.
- Function of router is to receive packets from one network and forward to another network based on information stored in routing table.

4.2.6 ROUTERS CONTINUE...



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- o Routing strategies:
- Adaptive Routing
 - In adaptive routing, a router may select new route for each packet.
- Non Adaptive Routing
 - In non adaptive routing router choose same path for all the packets whose destination is same.
- Routing table contains:
 - Network address of each device,
 - Possible paths between routers,
 - Cost of sending data over paths.

4.2.6 ROUTERS CONTINUE...

Types of routers:

1. Static router:

- 1. They use same path for all packets of same destination.
- 2. More secure.
- 3. Needs to maintain manually.
- 4. Can not updated automatically.

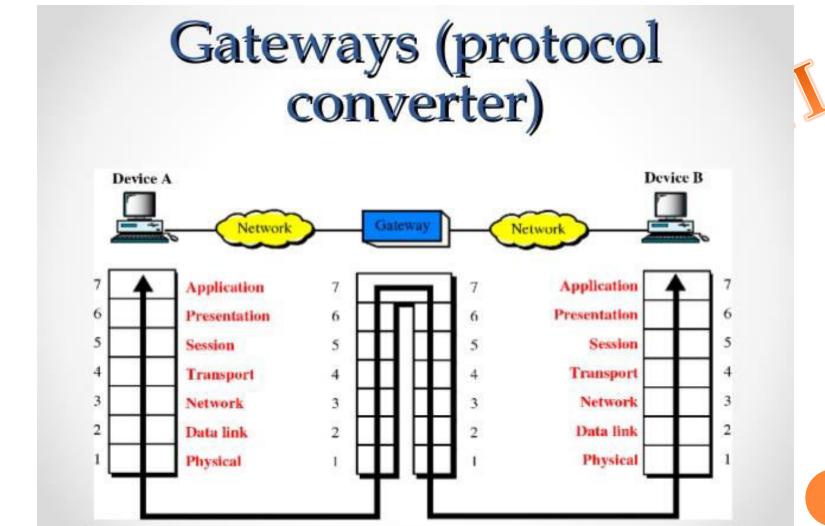
2. Dynamic router:

- 1.It uses a routing protocol such as OSPF or BGP to select best paths for packets.
- 2. Each packet is sent via different path.
- 3.Less secure.
- 4. Can be updated and Maintained automatically. 28

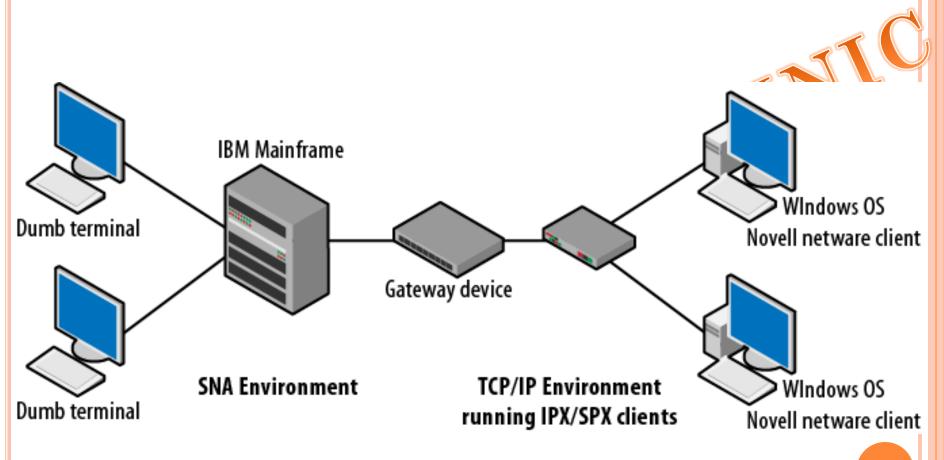
4.2.7 GATEWAYS

- It operates in all seven layers of OSI model.
- It is also called **protocol converter**.
- It is used to connect two different network types.
- o Difference between router and gateway:
 - Router connects networks having implemented similar protocols.
 - Gateways used to connect two different networks implemented using different protocols.
 - They adjust data rate, size and format of packets.

4.2.7 GATEWAYS CONTINUE...



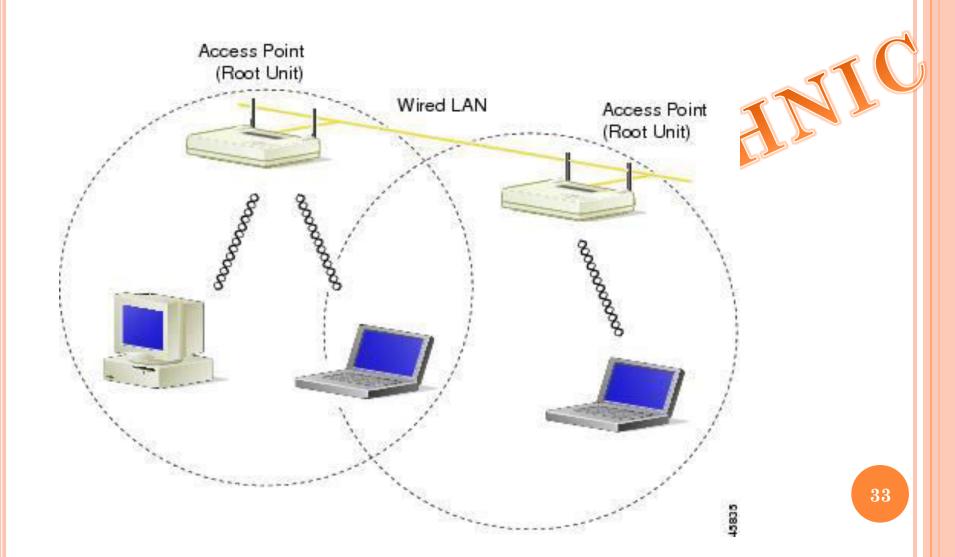
4.2.7 GATEWAYS CONTINUE...



4.2.7 ACCESS POINTS

- An Access Point connects directly to a wired LAN and then provides wireless connections using wireless LAN technology for other devices to utilize that wired connection.
- APs support the connection of multiple wireless devices through their one wired connection.
- It acts as a HUB between wired and wireless networks.
- It provides security and extend physical range of LAN.

4.2.7 ACCESS POINTS CONTINUE...



4.3. NETWORK MANAGEMENT SOFTWARE

- Network software is define as a collection of program's that can be installed on file server or node.
- NETWORK MANAGEMENT PROTOCOLS:
 - SNMP: simple network management protocols
 - RMON: remote monitoring protecols
- Types of network software:
- 1. Server Software
- o 2. Client Software

4.3. NETWORK MANAGEMENT SOFTWARE CONTINUE...

- Server Software:
- Server software is a type of software that is designed to be used, operated and managed on a computing server.
- server software may be classified into various forms, such as the following:
 - Web server software
 - Application server software
 - Database server software
 - Cloud computing server software
 - File server software
- Client Software:
- Software that resides in a user's desktop or laptop computer or mobile device. Contrast with server software.

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❖UNICAST, BROADCAST AND MULTICAST

- Unicast: it is a communication between single sender and single receiver.
- Multicast: It is used to transmit a single message to a selected group of receivers.
- Broadcast: It is used to transmit a packet in a network received by all the nodes.

IMP QUESTION

- 1. What Is NIC? And Also Explain Different Type Of NIC Card.
- 2. Give The Difference Between Repeater And Hub.
- 3. What Is Router? Which Information Can Store In A Router Table And Also Explain Various Routing Technology.
- 4. Explain Various Type Of Switch In Network System.
- 5. Explain Working Principle Of Gateway.
- 6. Explain Following Term:-
- Uncasting
- Broadcasting
- Multicasting

IMP QUESTION

- 7. Differentiate Hub and Switch.
- 8. How repeater is differs from an amplifier?
- 9. Explain use of Router with example.
- 10. Differentiate Bridge and Router.
- 11. Differentiate Layer-2 and Layer-3 switch.
- 12. Explain layer-3 switch. Give its advantage and disadvantage.
- 13. Discuss network management software in brief.